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COMPARATIVE TREND ANALYSIS IN COST OF PADDY CULTIVATION AND PROFITABILITY ACROSS THREE STATES OF INDIA

Chandra Guptha B., B.Sc., PDM
Agronomist, M.S.Swaminathan Research Foundation, Chennai, Tamil Nadu, India
Prabhakaran T. Raghu, M.Sc.
Senior Economist, M.S.Swaminathan Research Foundation, Chennai, Tamil Nadu, India
Aditi N., M.A.
Research Intern, M.S.Swaminathan Research Foundation, Chennai, Tamil Nadu, India
Kalaiselvan N.N., M.Sc.
Research Economist, M.S.Swaminathan Research Foundation, Chennai, Tamil Nadu, India
Arivudai Nambi V., Ph.D.
Director, Biodiversity, M.S.Swaminathan Research Foundation, Chennai, Tamil Nadu, India

Abstract

Agriculture has seen tremendous changes in the past century, with agricultural research investments paving the way for productivity gains leading to reduction in production costs and capacity to carter larger population. The contribution of agriculture to the GDP is on the decline and so does profitability. Farmer suicides were not a common phenomenon in India before 1990, but more than two lakh farmers committed suicides between 1990 and 2010. The underlying causes for failure in agriculture could be many including climate change, reduction in profitability and fragmentation of land. This article explores the trends in the cost of cultivation of paddy and its profitability in three Indian states of Kerala, Odisha and Tamil Nadu during the period 1999-2011. It is observed that the factors like hired machine and human labor, fertilizer, are all growing in varying proportions leading to an increase in the cost of cultivation. In the years showing profits, Profitability seemed to be averaging around ten percent and while in most of the years loss was reported. Over the years, the increase in cost of cultivation seems to be stable in contrast with the increase in value of paddy produced by farmers. The APM project has appropriately addressed issues of increasing cost of manures through introduction of vermicomposting. Other appropriate techniques and technologies have also been demonstrated for increased profitability. Efforts need to be taken to create an enabling environment to ensure a commensurate income to farmers for a dignified life.

Keywords: Indian Agriculture, Profitability, Cost of Cultivation, Value of Produce, Paddy

Introduction

Agriculture in the past century has seen many changes (Kropff *et al*., 2013). It has fed billions of people which seemed impossible earlier. This has been possible through investment in agricultural research and development (R&D), creating an enabling environment for extension, large scale technology adoption by farmers, immense production and good distribution of the produce. Indian agriculture has achieved tremendous growth in production and productivity of crops. Tyagi (2012) classifies agriculture in India into eras based on a historical perspective as: i) Pre independence – era of famines between 1900 to

1947, 2) post independence – Nehru – investments in agriculture, import of food grains between 1947 - 1964, 3) Green revolution – self confidence in agriculture – food self sufficiency between1965 – 1985, 4) Grain mountains and hungry millions between 1985 - 2000, 5) Policy fatigue – resulting in technology extension and production fatigue and farmer fatigue from 2000 to till date. Between 1950-51 and 2009-10, production of food grains increased from 51 million tonnes (mt) to 233 mt, while oilseeds production increased from 5.16 mt to 29.76 mt. Similar significant growth has also been achieved in sugarcane, cotton, fruits, vegetables and other crops (Government of India, 2009).

These achievements would not have been possible without the decisive role of Indian farmers (Swaminathan, 2008). The increased volume of crop output, which resulted from the intensification of agriculture after the introduction of Green Revolution during the mid-sixties, helped increase the wage rate and generate more employment opportunities in rural areas (Dev and Ranade, 1998; Saleth, *et al.*, 2003; Narayanamoorthy and Deshpande, 2003). Introduction of High Yielding varieties, construction of large scale irrigation projects, subsidy schemes on fertiliser, electricity, diesel, etc., increased profitability among farmers cumulatively facilitated increased production of agricultural commodities.

Figure 1. Chennai diesel price hike chart

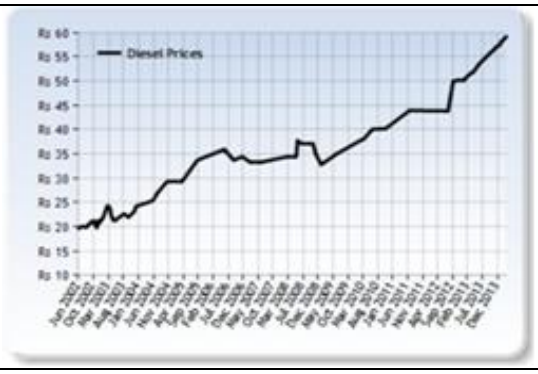
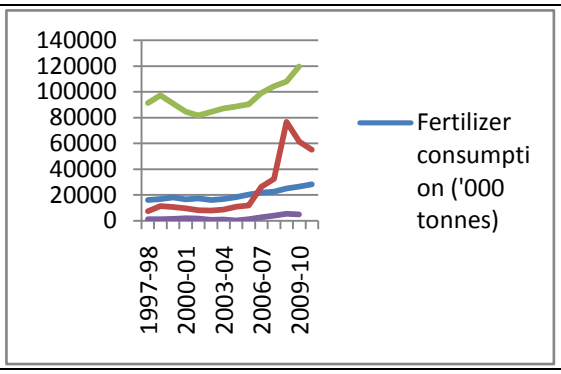


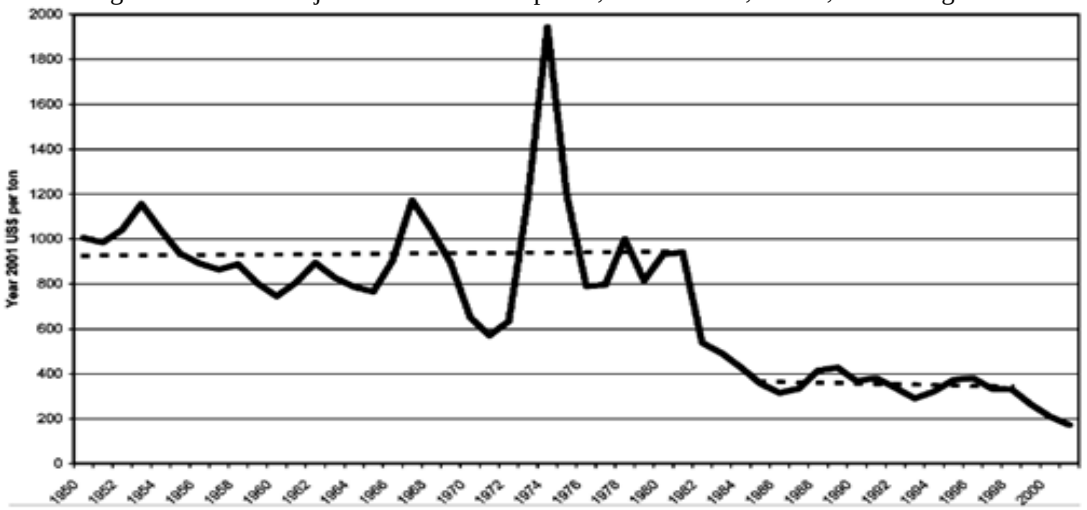
Figure 2. Feriliser and Electricity - Consumption



The Government of India is providing subsidies for agriculture at an increasing rate. Fertiliser subsidies alone touched INR.80,000 crores in the recent past. Apart from subsides, the actual price of important inputs has also been increasing. For instance the cost of diesel in 2002 was INR. 20 per litre while it was almost INR.60 in 2013. Over a decade, the price for diesel has tripled, but consumption continues to increase and so does the subsidies. Thus greater efforts are required to manage optimal production for providing food for large sections of people at affordable prices, while keeping in view the livelihood needs of farmers. Inflation has always had double impact on farmers with increasing cost of living and reduction in agriculture prices as a result of price intervention mechanisms of the government (Ramanjaneyulu, 2012). The situation has not improved in the post reform period since 1990s. The National Commission on Farmers (2006) expressed its distress about the unsustainable and joyless growth that bypassed large sections of the population notably the farming community, 40 percent of whom wished to quit farming provided they had an option. Farmers' suicides, indebtedness, crop failures, un-remunerative prices for crops and poor returns over cost of cultivation are the key features of Indian agriculture today. Farmers committing suicides was uncommon before the early 1990s, but has become a widespread phenomenon today in many States of India **(**Narayanamoorthy 2013**).** Over two lakh farmers committed suicides in India between 1990-91 and 2009-10 and the proportion was alarmingly high in States notably Maharashtra, Andhra Pradesh and Karnataka (Sainath 2010). It has been reported that over 2000 farmers quit agriculture every day (Sainath 2013). Growth rate of India has been high in the last two decades and per capita incomes and purchase power

parity has also increased. However, the contribution of agriculture to the economy has been declining. Profitability in Indian agriculture also seems to have been declining (Alagh 2013). While the entire economy is developing, average incomes are increasing, reducing relative incomes of farmers is not a healthy growth trend. The world prices of paddy have fallen after increased productivity and production period of the green revolution. The pre green revolution period of 1950 to 1964 was characterised by high and unstable prices. The green revolution period from 1965 to 1981 when modern fertiliser responsive varieties were adopted in many countries was a period of high and unstable prices. The years 1982 – 1984 marked a short transition to a post green revolution regime of low and stable prices during 1985-1998. More recently, from 1999 to 2001 the prices have plunged once again (Dawe 2002). However in 2007 – 2008 food prices across the world has witnessed a hike.

Figure 3. Inflation adjusted world market prices, 1950 – 2001, 100Bs, FOB Bangkok.



Note - Dashed lines indicate time trends for 1950 – 1981 and 1985 – 1998

In spite of good overall economic growth It is important to explore the underlying reasons for distress in farming, which could possibly inter alia be climate change, vagaries of monsoon, fragmentation of land, increasing cost of living, lack of modernisation and or a combination of factors. In light of these observations, the present article tries to explore trends in cost of cultivation and profitability among paddy farmers in three states of India: Kerala, Tamil Nadu and Odisha.

Data and Method

Data provided by the Commission on Agricultural Costs and Prices (CACP) from 1999 – 2000 to 2010 – 2011 were used for the analysis across Kerala, Tamil Nadu and Odisha, states in which the Alleviating Poverty and Malnutrition (APM) Project is being implemented jointly by the M.S. Swaminathan Research Foundation, Chennai, India and the University of Alberta, Edmonton, Canada. The trends in cost of cultivation, its components, profitability and the increase in cost of cultivation along with value of produce were analyzed, and the results presented in three dimensions: i) Trends in cost of cultivation, ii) Trends in profitability, and iii) Trend in relative change in cost of cultivation and value of produce.

The final cost of cultivation used in the analysis includes inter alia all actual expenses in cash and kind incurred in production by owner, interest on value of own capital assets (excluding land), rental value of own land (net of land revenue) and rent paid for leased in land, imputed value of family labour (estimated by taking into account statutory minimum or actual wage or whichever is higher), and an additional ten percent for carrying out the managerial functions performed by the family.

In order to analyze the trends in the cost of cultivation, the major contributing factors notably hired human labour, hired machine labour, fertilizer, manure, insecticides and interest on working capital were identified. These major contributing factors were compared to the cost of cultivation in terms of (i) actual values and changes over the years and (ii) percentage to cost of cultivation. Profitability was analyzed as percentage of profit or loss made over the cost by the formula: [{(Value of Produce/ Cost of Cultivation)-1}*100]. In order to compare the increase in cost of cultivation and value of produce, the percentage change of both were calculated across the years. Relative change in increase in value of produce in comparison to cost of cultivation was calculated using the formula: (Percentage (%) change in value of produce over previous year) – (Percentage (%) change in cost of cultivation over previous year)

Baseline crop production data generated by the APM project field level surveys were compared with State Level average. In addition, field level yield data on agronomic trials in paddy in project sites were also compared with state averages. For purposes of smoothening abnormal valuesin data has been excluded from the analysis.

Result and Discussion

Trends in cost of cultivation across three states of India

Cost of Cultivation (CC): Trend in CC for three states of Kerala, Odisha and Tamil Nadu during the period 1999 – 2000 to 2010 – 11 indicate that hired human labor, hired machine labor, fertilizer, seeds, pesticides, interest on working capital are the major contributing factors among others to CC. It is lowest in Odisha and highest in Kerala, and has been increasing over the period. Excepting the years 2001and 2003 for the state of Odisha, CC has increased over the previous years' CC across the three states in all other years. The increase in CC over previous years averaged at INR.2055, INR.1570 and INR.2162 per hectare (all INR. values mentioned represent per hectare unless otherwise mentioned) for Kerala, Odisha and Tamil Nadu respectively (KOTR). The highest increase was observed in the year 2010 at INR.7389 for Tamil Nadu and the least increase was observed in at INR.24 for Odisha in 2005. CC increased by a factor of 1.85, 2.04 and 1.74 for Kerala, Odisha and Tamil Nadu respectively during the period. The overall trend indicates that CC would continue to increase consistently in all the three states.

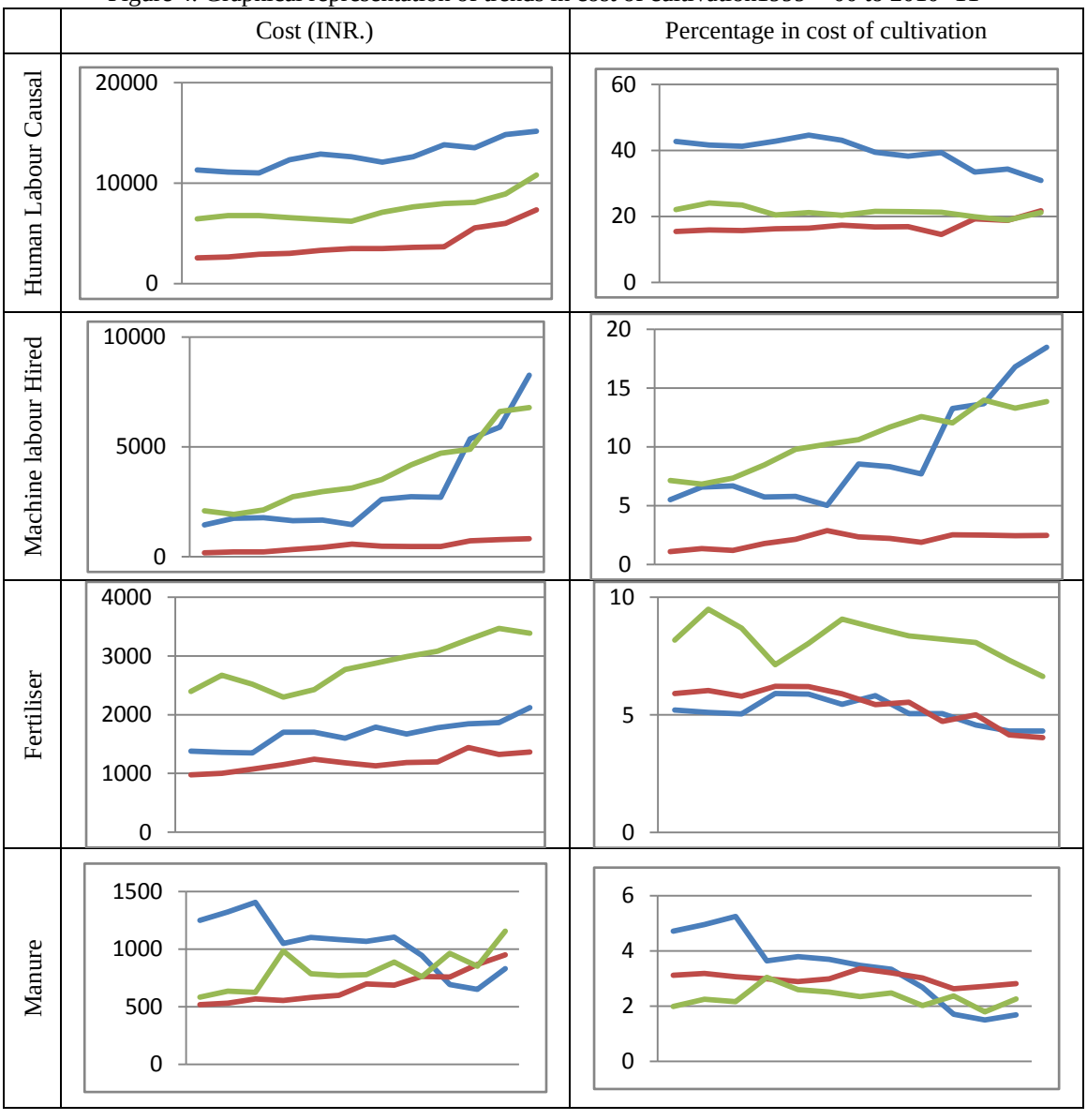
Hired Human Labour : Trend in cost on hired human labour indicate that it has largely increased over the years, The increase in cost for hired human labour averaged at INR.350, INR.435 and INR.394 for Kerala, Odisha and Tamil Nadu respectively. The maximum increase over previous year was recorded for Tamil Nadu during the year 2011 by INR.1864, while the least increase recorded for Odisha in 2006 by INR.4. An example of maximum reduction was seen for Kerala during the year 2006 by INR. 539. Excepting, 2001, 2002, 2005, 2006, 2009 for Kerala and 2003, 2004, 2005 for Tamil Nadu, all other years have shown an increase in cost for hired human labour over previous year. Cost on hired human labour increased by a factor of 1.33, 2.87 and 1.67 for Kerala, Odisha and Tamil Nadu respectively. The percentage contribution of cost on hired human labour to CC has reduced from 43% in 2000 to 31% in 2011 for Kerala, and has increased from 15% in 2000 to 22% in 2011 for Odisha and has relatively been constant at around 20% for Tamil Nadu.

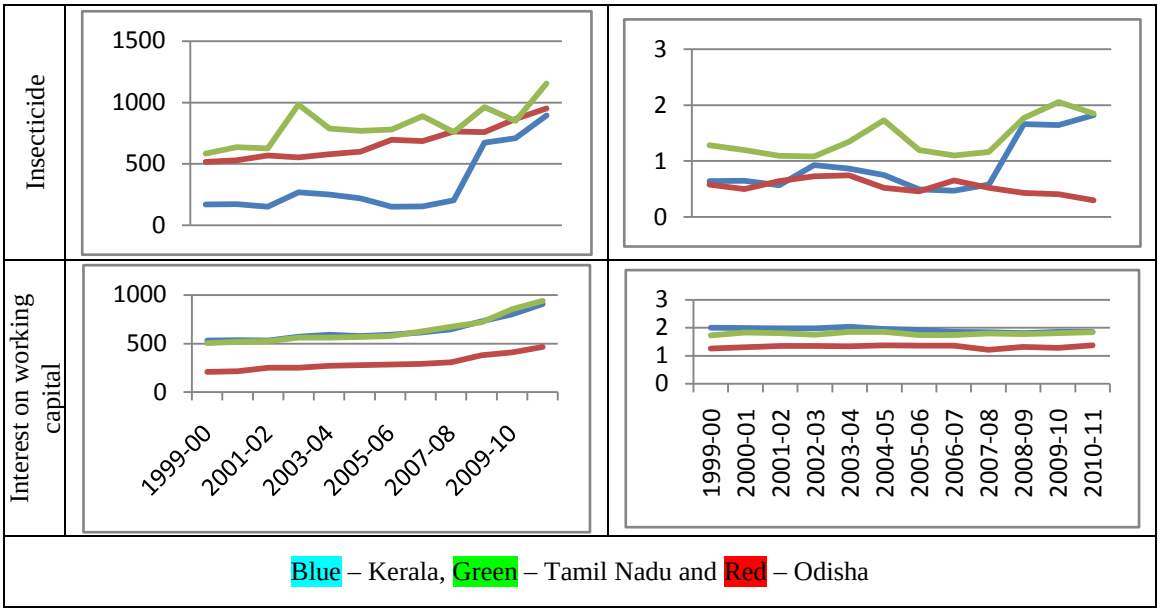
Hired Machine Labour: Trend in cost on hired machine labour indicate that it has predominantly increased over the previous years, however there are instances where the cost incurred for hired labour has reduced over previous year. The increase in cost for hired machine labour averaged at INR.618, INR.59 and INR.428 for KOTR. The maximum increase over previous year was recorded for Kerala in the year 2009 by INR.2656, while least increase was recorded for Odisha in 2008 by INR.4 and maximum reduction was in Tamil Nadu for the year 2001 by INR.162. Excepting, 2003, 2005, 2008 for Kerala, 2002,

2006, 2007 for Odisha and 2001 for Tamil Nadu, all other years have shown an increase in cost for hired machine labour over previous year. Cost on hired machine labour increased by a factor of 5.67, 4.60 and 3.25 for KOTR. The percentage contribution of cost on hired machine labour to CC has increased from 6% in 2000 to 17% in 2011 for Kerala, it has increased from 1% in 2000 to 2% in 2011 for Odisha and it has increased from 7% in 2000 to 13% in Tamil Nadu. The increase in cost on hired machine labour correspondingly leads to reduction of cost on other labour forms.

Fertilisers: Trend in cost on fertilizer indicate that it has predominantly increased over the previous years, however there are instances where the cost incurred for fertilizer has reduced over previous year. The increase in cost on fertilizer averaged at INR.67, INR.35 and INR.90 for KOTR. The maximum increase over previous year was recorded for Tamil Nadu in the year 2005 by INR.342, while least increase was recorded for Odisha in 2008 by INR.12 and maximum reduction was in Tamil Nadu for the year 2002 by INR.156. Excepting, 2001, 2002, 2005, 2007 for Kerala, 2005, 2006, 2010 for Odisha and 2002, 2003 for Tamil Nadu, all other years have shown an increase in cost for fertilizer over previous year. Cost on fertilizer increased by a factor of 1.53, 1.39 and 1.41 for KOTR.

Figure 4. Graphical representation of trends in cost of cultivation1999 – 00 to 2010 -11





The percentage contribution of cost of fertilizer to CC has been relatively constant and has slightly reduced from 5% to 4% in Kerala, from 6% to 4% for Odisha and 8% to 7% for Tamil Nadu from 2000 to 2011.

Manure: Trend in cost on manure indicates that it has predominantly increased over the previous years, in Tamil Nadu and Odisha while it has predominantly reduced in Kerala. The increase in cost on manure averaged at INR.39, INR.51 for Tamil Nadu and Odisha respectively and reduced by INR.38 for Kerala. The maximum increase over previous year was recorded for Tamil Nadu in the year 2003 by INR.357, while least increase was recorded for Odisha in 2001 by INR.13 and maximum reduction was in Kerala for the year 2003 by INR.357. Excepting, 2003, 2007, 2009 for Odisha, 2002, 2004, 2005, 201 for Tamil Nadu all other years have shown an increase in cost for manure over previous year. Excepting 2001, 2002, 2004, 2007 and 2011 for Kerala, all other years have shown a decrease in cost for manure over previous year. Cost on manure increased by a factor of 1.84, 1.97 for Odisha and Tamil Nadu respectively. Cost on manure decreased by a factor of 0.44 for Kerala.

The percentage contribution of cost of manure to CC has reduced from 5% to 2% in Kerala, from 3.12% to 2.81% in Odisha and increased from 1.98% to 2.23% for Tamil Nadu from 2000 to 2011. The price of manures has increased and cost on them has reduced in Kerala which indicates that quantity used has reduced at a higher rate in Kerala. The cost on manures has increased more than the cost of fertilizers over the years.

Insecticide: Cost on insecticides increased by a factor of 5.28, 1.84 and 1.97 KOTR, between 2000 and 2011. Based on current trend cost on insecticides would increase in Kerala and Tamil Nadu while slightly decrease in Odisha.

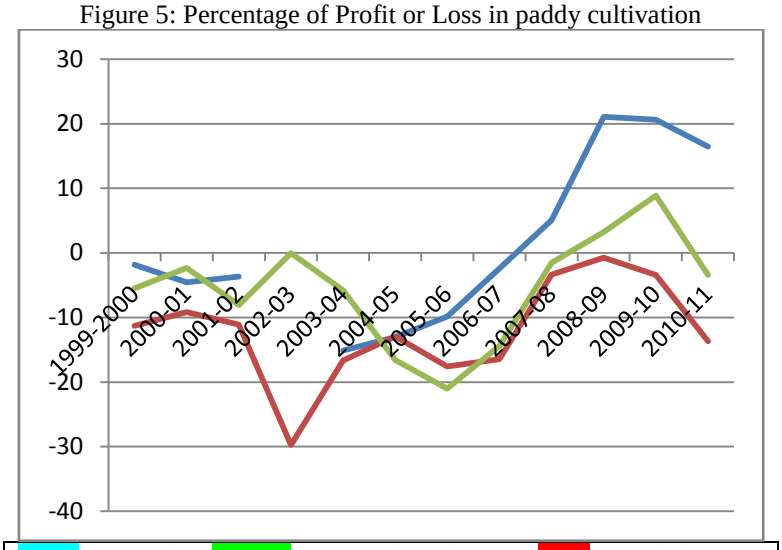
Interest on working capital: Cost of interest on working capital increased by a factor of 1.71, 2.22, and 1.85 for KOTR, between 2000 and 2011. Based on current trend cost of interest on working capital would remain relatively constant between one to two percent. However, considering the fact that usury prevails in India and especially backward areas with poor banking services, increased working capital requirements would also be detrimental for profitability of farming

Profitability in Paddy Cultivation

Profitability in paddy cultivation shows a variable trend across Kerala, Odisha and Tamil Nadu. Among the three states, Kerala is relatively better in generating profits while Odisha is the poorest. The exception to this has been during the global food price hikes

during 2007 and 2008. On the whole the trends have been that paddy cultivation has been a loss generating livelihood.

Figure 5: Percentage of Profit or Loss in paddy cultivation



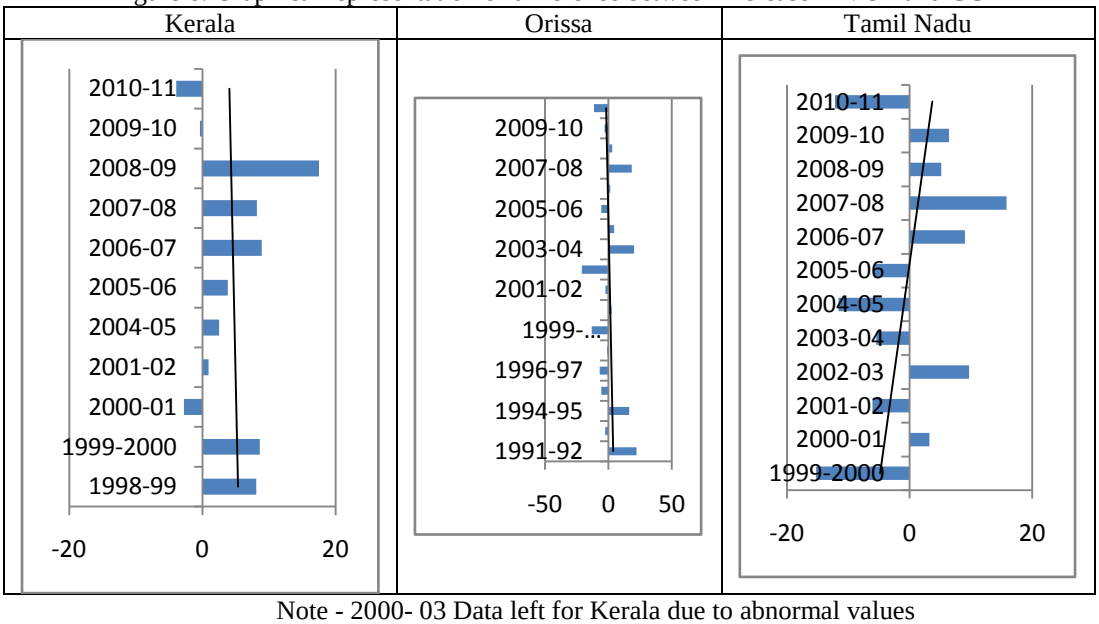
Blue – Kerala, Green – Tamil Nadu and Red – Odisha

Note - 2000- 03 Data left for Kerala due to abnormal values

Farmers have incurred losses for 8 years, 12 years and 10 years for KOTR over a period of 12 years. Further the losses generated were more than 10% in 2 years, 8 years and 3 years for KOTR. Profits have been less than 10% once in Kerala and twice in Tamil Nadu. Kerala has had more than 10% profitability only thrice in those years. In none of the years, profit or loss has been more than 50%. The average profits generated was INR.1142 for Kerala. The average loss per hectare for Odisha was INR.2571 and INR.1859 for Tamil Nadu. Maximum profit was recorded for Kerala at INR.8918 for the year 2009-10 and the maximum incurred loss recorded at INR.7592 in 2005. Farmers continue paddy cultivation largely due to lack of alternatives.

Relative increase in cost of cultivation and value of produce

Figure 6. Graphical representation of difference between increase in VOP and CC



Note - 2000- 03 Data left for Kerala due to abnormal values

A comparative analysis of relative increase in cost of cultivation and value of produce across three states was carried out. In Kerala, the difference has been positive in 8 out of 11 years. Only once this difference has been more than 10 percent. Compared to the other two states, farmers from Kerala are placed better as CC has not frequently increased beyond Value of Produce. However, the trend line indicates that the margin is reducing over the years. In case of Orissa, only in 8 out of 18 years, the difference has been positive and only in 4 such years the difference has been more than 10 percent. In 3 out of 10 years the difference is negative and more than 10 %. These indicate that Orissa is poorly placed when compared to other two states. The trend line indicates that the margin has reduced and grown negative over the years. In the case of Tamil Nadu, the difference has been positive in 6 out of 12 years where only one year the margin has been more than 10%. However, in 3 of the remaining 6 years where the difference has been negative, it has been more than 10 percent. However, in between 2006 and 2011, 4 years have had a positive difference and the trend line indicates that the margin is increasing. The changes also indicate that if the margins for farmers are good in a particular year, it reverses in consecutive years. External factors may be responsible for the same.

Comparison and Implications for APM project sites

Paddy is an important crop both in terms of nutrition and income in the three APM project sites. The derived state level data shows that the PVS trial data falls both above and below state averages. This also indicates that there is possibility for a potential increase in productivity of paddy in these areas and can be tapped through agronomic trials and demonstrations. Increase in yields would also likely to reflect increased income and nutrition levels of communities. Interactions with communities indicated that there is a widespread perception that the cost of inputs like fertilizer and manure, insecticides is increasing over the years while the value of produce has not increased commensurately, which corroborates with evidence in the current paper.

Table 1. Comparison of State level data with project data

Parameters/ State/Site	**Kerala/Wayanad**	**Odisha/Jeypore**	**Tamil Nadu /Kolli Hills**
State level Derived Yield data from CACP Average between 1999 – 2012	3.6	3.0	4.7
Data from APM Baseline survey average Yields	3.7	1.7 (Upland) 3.3 (Low land)	2.9 (Kharif Low land)
Participatory Varietal Selection (PVS) Yield data from APM sites*	3.5 to 5.1 (Kharif low land)	2.5 to 3.1 (Up land) 4.4 to 5.2 (Low land)	2 to 4.3 (Kharif Low land) 2.2 to 2.9 (Rabi Low land)
Data from APM Baseline survey average on land holding	1.05 (Total) 0.44 (Low land)	1.93 (Total) 0.19 (Low land)	1.78 (Total) 0.91 (Low land)
Projected Yields for average land holding for low land in tons	1.54 to 2.24	0.836 to 0.988	1.82 to 7.81

* Indicative as the results is from varietal selection trials stage

The APM project has partially addressed the issue of increasing cost of manures and fertilizers by promoting vermicomposting as a technology which supplements non-availability of manures. This vermicomposting technology is likely to be an advantage to the community by providing a new source of soil fertilization in the years to come. The issues of increasing cost of labour, non- availability of labour and timely availability of labor has been addressed by partial mechanization. Value addition efforts have been taken up for various commodities which can address enhancing value of produce. Further technological options

are required to be explored to concurrently enhance income and nutrition of communities in the project locations.

Limitations

The data available is limited to 12 years only. A longer time series analysis is likely to help draw conclusive results. While detailed categories of cost of cultivation were available, some data like the split up in cost accrued to diesel in hired machine labour were missing. While there are complex factors influencing profitability of agriculture, detailed information on impact of these factors are not available to enable projections. Since cost concepts were not deployed in project sitesas part of the project efforts, there is a gap in field level information, hampering comparability with state level averages.

Conclusion and way forward

This study was carried out to enhance understanding on the cost of cultivation at the project sites and gain some insights for seeking pathways for action. Analysis of profitability of paddy cultivation over the years show that farmers have either received very little profit or have encountered losses. The cost of cultivation has been increasing over the years and at a higher rate than the increase in the value of produce. However, after the global food crisis and increase in food prices profitability seems to have marginally increased. In many years farmers face losses, not only because of lack of monsoons or drought but also due to overall decline in profits from farming. Appropriately, the APM project has attempted to address issues of increasing cost of inputs, non-availability of manure and labor, and increasing cost of cultivation through a set of technologies like vermicomposting, green manure and enhancement of soil health. In addition, efforts focused on increasing the value of produce of paddy or the prices realized by farmers are pathways of the future. It is the responsibility of the global society to create an enabling environment for farmers to be remunerated well and provide for a dignified life.

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